SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2615E

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Superseding AMS 2615D

## Pressure Testing, Hydraulic Pressure as Specified

1. SCOPE:

1.1 Application:

This specification provides requirements and procedures for hydraulic-pressure leak testing of parts.

1.2 Classification:

The following classes of tests establish the allowable leakage as follows:

Class A - No visible leakage permitted.
Class B - 2 mL/minute.
Class C - 2 mL/minute for any area bounded by a 1-inch (25-mm) diameter circle.
Class D - Very slow leak allowing the surface to become slightly moist or damp.
Class E - A specified leakage rate acceptable to purchaser.

1.2.1 If a class is not specified, Class A shall apply.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

Not applicable.

3. TECHNICAL REQUIREMENTS:

3.1 Equipment:



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3.1.1 Fixtures: Test fixtures and apparatus shall be designed and constructed to seal off only the ports and passages required to pressurize the part, and to permit 100% evaluation of all areas of the part where leakage could occur. The design shall not induce any stress on the part other than that provided by the test media. If pressure testing cannot be accomplished without inducing additional stresses, the design, including fitting types, shall be approved by the purchaser.

3.1.2 Gaskets: Gasket material shall be used with plugs or blanking plates to prevent damage to finished surfaces when sealing. Flanges or fittings designed for use with specific O-rings or gaskets shall use those for test. Formed-in-place gaskets that could mask dimensional or surface flaws shall not be used except for unmachined castings.

3.1.3 Bleeder Ports: Valved bleeder ports shall be provided to release entrapped air.

3.1.4 Instruments: Pressure gauges and flow meters shall have sufficient dial divisions or readability to permit monitoring of specified pressure, with maximum gauge capacity not more than five times test pressure and readability or marked increments not less than 5% of test pressure. Gauges shall have been calibrated, within one year of use, using either primary standards or standards traceable to the National Institute of Standards and Technology.

3.1.5 Safety Tank or Screen: A suitable tank or screen shall be provided to protect the operator in case of failure of a part (See 8.4).

3.1.6 Drying Oven: A circulating-air oven shall be used for drying parts subject to corrosion.

3.2 Test Media:

Water, hydraulic fluid, or suitable petroleum-base test fluid shall be used. The test media shall be inert to the part and shall have a viscosity of 25 centistokes or less.

3.3 Preparation:

3.3.1 Cleaning: The part shall be thoroughly cleaned and dried before testing so that any leaks will be visible. Loose particles, machine shop chips, oils, and other foreign materials shall be removed before pressure testing.

3.3.2 Processes: The part or subassembly shall be tested following all machining, forming, straightening, welding, brazing, anodizing, etc, and prior to application of other protective finishes such as paint, plating, coating, and surface finishes that may mask or blank off areas of possible leakage.

3.3.3 Chemical Film and Passivation: Chemical film protective finishing of aluminum and magnesium and passivation of stainless steel may be performed either before or after pressure testing.

3.3.4 Impregnation: Impregnation of castings shall not be permitted except as authorized by purchaser and then only to correct general seepage leaks. Impregnation shall not be used to correct poor foundry techniques, visible holes, or excessive porosity. Impregnation, when permitted or authorized by purchaser, shall be conducted after heat treatment, brazing, and welding have been completed.

3.3.5 Preliminary Tests: Tests may be performed at any stage of manufacture to establish in-process integrity. However, requirements apply to finished parts prior to finish coating (See 3.3.2 and 3.3.3).

3.3.6 Material Removal: Sand blasting, pickling, or any other operation which may remove metal from surfaces shall be done before final pressure tests.

3.4 Procedure:

Parts shall be fitted up for test, surfaces opposite those under pressure shall be dried, and part or passage shall be filled with water or other suitable liquid. After all air has been expelled from internal passages under test, the pressure specified by purchaser shall be applied to the liquid and maintained for sufficient time to establish the rate of leakage.

3.4.1 Duration: Parts shall be held under pressure for not less than three minutes to allow leakage indications to develop prior to visual inspection.

3.4.2 Entrapped Air: Care shall be exercised that no air or other gas is trapped in the part being tested or in any of the feeder lines associated with the testing fixture. Bleeders shall be provided to release entrapped air or gas so that the entire part volume is filled with liquid.

3.4.3 Cleaning: Parts shall be cleaned and dried, immediately after test, to prevent corrosion due to entrapment of moisture. Visible moisture shall be removed by air blast. Parts containing areas of entrapment and all parts subject to corrosion shall be dried in a circulating-air oven not exceeding 275°F(135 °C) for sufficient time to ensure removal of moisture (See 5.1).

3.4.4 Orientation: The part shall be exposed, during static pressure application, to permit overall visual inspection.

3.5 Acceptance Standards:

3.5.1 Leakage: Parts which do not show any visible sign of leakage under pressure, which meet a drawing specification, or which meet other specified leakage limits are acceptable. The effect of any leakage of parts shall be reviewed by cognizant personnel and the parts accepted, repaired and retested, or rejected as agreed upon between purchaser and vendor. When leakage requirements have not been agreed upon, no visible leakage is acceptable.

3.5.2 Distortion: Parts that show no indication of having been weakened or abnormally distorted and which do not leak under pressure beyond the specified leakage limits are acceptable.

3.5.3 Rubber Hose: Natural or synthetic rubber hose without reinforcing braid may exhibit up to 15% enlargement of its diameter during the test provided the hose returns to within 2% of its original diameter at all places along the entire length when the pressure is released.

3.5.4 Braided Rubber Hose: Parts may show a slight extrusion through the braid during test but, when pressure is released, the hose shall show no extension outside the braid beyond that which existed before test. Braid shall fit as snugly after test as before test.

3.5.5 Metal Tubing: Tubes shall not have a permanent set of more than 1.0% increase in diameter at any place along the entire length.

3.6 Tolerances:

Applied pressure tolerances shall be as shown in Table 1.

TABLE 1A - Pressure Tolerance (Inch/Pound Units)

| Specified Pressure psi | Tolerance plus and minus |
|---|---|
| Up to 20, incl | 2 psi |
| Over 20 to 80, incl | 4 psi |
| Over 80 | 5% |

TABLE 1B - Pressure Tolerance (SI)

| Specified Pressure kPa | Tolerance plus and minus |
|---|---|
| Up to 138, incl | 14 kPa |
| Over 138 to 552, incl | 28 kPa |
| Over 552 | 5% |

3.7 Marking:

When specified, each part that has passed pressure test shall be marked with the letter "L". The marking shall appear adjacent to other part markings, and shall be made with permanent ink unless other marking methods are agreed upon.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Reports:

The pressure test vendor shall furnish with each shipment a report stating that the parts have been tested in accordance with requirements of this specification and that they conform to the technical requirements. This report shall include the purchase order number, AMS 2615E, test pressure, class of test, part number, and quantity.

5. PREPARATION FOR DELIVERY:

5.1 Preservation:

Parts shall be protected from corrosion prior to shipment by a method acceptable to purchaser.

6. ACKNOWLEDGMENT:

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Parts that do not meet the requirements of this specification, or modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 A change bar ( I ) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. An (R) symbol to the left of the document title indicates a complete revision of the specification, including technical revisions. Change bars and (R) are not used in original publications, nor in specifications that contain editorial changes only.

8.2 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 Terms used in AMS are clarified in ARP1917.

8.4 This procedure requires visual examination of a part at close range while the part is internally pressurized. It is recommended that parts be proof pressure tested at a test pressure higher than the leakage test pressure before leak testing, and while enclosed in a safety chamber (See 3.1.5). Where this cannot be done, the leakage test should be done in a safety chamber or mesh, and external surfaces examined for evidence of leakage after the release of pressure.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "B"